

CHAPTER 4

PROCESS UNITS - PERIODIC REPORTING AND RULE 219 EQUIPMENT

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AND RULE 219 EQUIPMENT

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Process units are one or more pieces of equipment which are listed in Table 1-C. The process units emissions are reported quarterly as shown in Table 4-A and based primarily on fuel consumption or operating time in conjunction with an emission factor. The requirements and procedures for an emission factor and election conditions for an alternative emission factor shall apply to process units. For equipment designated as exempt from permit in Rule 219 emissions shall be determined according to the methodology specified in this Chapter 4, subdivision F.

Process units and equipment exempt from permit as designated in Rule 219 may share fuel meters if each equipment has the same emission factor. This chapter also includes the equations describing the methods used to calculate NO_x process unit emissions and the reporting procedures. The interim reporting period does not apply to process units since existing fuel metering equipment or timers shall be used starting January 1, 1994 for Cycle 1 facilities and July 1, 1994 for Cycle 2 facilities.

A. MONITORING, REPORTING, AND RECORDKEEPING REQUIREMENTS

1. The category-specific starting emission factor found in Table 1 of Rule 2002 - Allocations for Oxides of Nitrogen (NO_x) and Sulfur (SO_x) shall be used for quantifying quarterly mass emissions for a NO_x process unit.
2. The Facility Permit holder of a process unit may request a category-specific emission rate that is reliable, accurate, and representative for purposes of calculating NO_x emissions. The emission rate shall be determined based on the source testing protocol specified in Chapter 5.
3. The Facility Permit holder of a process unit shall calculate the mass emissions according to the methodology specified in Paragraph 4.B.2. (totalizing fuel meters) or 4.B.3.a. (timers).
4. The Facility Permit holder of each NO_x Process Unit shall use a totalizing fuel meter or timer as applicable, as specified in the Facility Permit for each NO_x process unit to measure and report the variables listed in Tables 4-A and 4-B, respectively, for each NO_x process unit.
5. Fuel flow measuring devices used for obtaining stack flow in conjunction with F-factors shall be tested as installed for relative accuracy using reference methods to determine stack flow.

If the flow device manufacturer has a method or device that permits the fuel flow measuring device to be tested as installed for relative accuracy, the Facility Permit holder shall request approval from the Executive Officer to use the manufacturer's method. Approval will be granted in cases where the Facility Permit holder can demonstrate to the satisfaction of the Executive Officer that no suitable testing location exists in the exhaust stacks or ducts and that it would be an inordinate cost burden to modify the exhaust stack configuration to provide a suitable testing location. The method or device used for relative accuracy testing shall be traceable to NIST standards. This method shall be used only if natural gas, fuel oil, or other fuels can be shown, by the Facility Permit holder to have stable F-factors and gross heating values, or if the Facility Permit holder measures the F-factor and gross heating value of the fuel. A stable F-Factor is defined as not varying

by more than +/-2.5% from the constant value used for F-Factor. For the fuels listed in 40 CFR 60, Appendix A, Method 19, Table 19-1, the F-Factors are assumed to be stable at the value cited in Table 19-1. Any F-Factor cited in Regulation XX shall supersede the f-Factor in Table 19-1. For fuels not listed in the citations above, but which the Facility Permit holder can demonstrate that the source-specific F-Factor meets the same stability criteria, periodic reporting of F-Factor may be accepted and the adequacy of the frequency of analyses shall be demonstrated by the facility such that the probability that any given analysis will differ from the previous analysis by more than 5% (relative to the previous analysis) is less than 5%. Analysis records shall be maintained, including all charts and laboratory notes.

6. Fuel meters and/or timers have to be non-resettable and tamper-proof. They have to have seals installed by the meter/timer manufacturer to prove the integrity of the measuring device.

Meters which are unsealed for maintenance or repairs shall be resealed by an authorized manufacturers representative.

7. The Facility Permit holder of each NO_x process unit shall monitor, report, and maintain the following records on a quarterly basis:
 - a. Type and quantity of fuel burned, in units of millions of standard cubic feet per quarter (mmscf per quarter) for gaseous fuels or thousand gallons per quarter (mgal per quarter) for liquid fuels, expressed to at least three significant figures; or
 - b. Total hours of operation; and
 - c. Production/Processing/Feed rate.
8. The Facility Permit holder of each NO_x process unit shall also provide any other data necessary for calculating the emission rates of nitrogen oxides as determined by the Executive Officer.

B. EMISSION CALCULATION FOR REPORTING DATA

1. Quarterly Mass Emissions for Interim Periods

Pursuant to Rule 2012 (f) (1), between January 1, 1994 and December 31, 1994 for Cycle 1 facilities, and between July 1, 1994 and June 30, 1995 for Cycle 2 facilities, the monthly emission of each process unit shall be calculated and recorded according to:

$$E_{ip} = \sum_{j=1}^r d_j \times EF_{sj} \quad (\text{Eq.22})$$

where:

E_{ip}	=	The quarterly mass emission of nitrogen oxides for interim period (lb/quarter).
d_j	=	The quarterly fuel usage for each type of fuel recorded as mmscf/quarter or mgal/quarter).
EF_{sj}	=	The starting emission factor used to calculate unit emissions in the initial allocation, as specified in Table 1 of Rule 2002 - Allocations for Oxides of Nitrogen (NO_x) and Sulfur (SO_x) (lb/mmscf, lb/mgal).
r	=	The number of different types of fuel consumed per quarter.
j	=	Each type of fuel.

Example calculation: Boiler burning natural gas, rated 6 mmBtu/hr, in compliance with Rule 1146
starting year 1994

Emission factor = 49.18 lb/mmscf

Quarterly fuel usage = 1.1 mmscf per quarter

$$\begin{aligned} E_{ip} &= (49.18) \times (1.1) \\ &= 54.1 \text{ lb/quarter} \end{aligned}$$

Applicable emission factor is also found in Volume II - Supporting Documentation, Appendix II-F - Methodology for NO_x and SO_x Starting and Ending Allocation Factors, Table 2-4 - Startpoint 1994 Emission Factors for Nitrogen Oxides.

2. Totalizing Fuel Meter-Based Emission Calculation

The Facility permit holder shall use an emission factor shown in Table 1 of Rule 2002 or in Table 3-D or an approved equipment-specific or category-specific emission rate for each affected NO_x Process Unit to calculate the quarterly emissions according to:

$$E_k = \sum_{j=1}^r d_j \times EF_j \quad (\text{Eq.23})$$

or

$$E_k = \sum_{j=1}^r d_j \times V_j \times ER_j \quad (\text{Eq.24})$$

where:

E_k = The quarterly emissions of nitrogen oxides (lb/quarter).

d_j = The quarterly fuel usage for each type of fuel recorded by the fuel totalizer (mmscf/quarter or mgal/quarter)

EF_j = The emission factor specified in Table 1 of Rule 2002 - Allocations for Oxides of Nitrogen (NO_x) and Sulfur (SO_x) or specified in Table 3-D (lb/mmscf, lb/mgal). The emission factor found in Table 1 of Rule 2002 may or may not include the appropriate control efficiency.

V_j = The higher heating value of each type of fuel (mmBtu/mmscf or mmBtu/mgal) determined by the Facility Permit holder or assigned from Table 3-D.

ER_j = The equipment-specific or category-specific emission rate; fuel-specific emission rate requested by the Facility Permit holder (lb/mmBtu).

r = The number of different types of fuel consumed per month.

3. Timer-Based Emission Calculations

- a. If the NO_x process unit is equipped with a timer, the quarterly fuel usage shall be estimated according to Eq. 25, 26, 27, and 28 and the quarterly emissions for each affected NO_x process unit shall be calculated according to Eq. 23 and 24.

If the NO_x process unit does not measure fuel with a totalizing fuel meter, the quarterly fuel consumption for each affected equipment shall be estimated according to:

$$d = d_{pu} \times (H/H_{pu}) \quad (\text{Eq. 25})$$

where:

d = The estimated quarterly fuel consumption of an affected NO_x process unit without a dedicated fuel meter (mmscf/quarter or mgal/quarter).

d_{pu} = The quarterly fuel consumption of all NO_x process units at the facility (mmscf/quarter or mgal/quarter).

H = The quarterly heat input of an affected equipment without a dedicated fuel meter (mmBtu/quarter).

H_{pu} = The quarterly heat input of all NO_x process units at the facility (mmBtu/quarter).

Example Calculation:

$$\begin{aligned}
 d_{pu} &= 1,587 \text{ mmscf/quarter} \\
 H &= 5,400 \text{ mmBtu/quarter} \\
 H_{pu} &= 27,000 \text{ mmBtu/quarter} \\
 d &= d_{pu} \times (H/H_{pu}) \\
 d &= 1,587 \text{ mmscf/qtr} \times (5,400 \text{ mmBtu/qtr} \\
 &\quad - 27,000 \text{ mmBtu/qtr}) \\
 d &= 317.4 \text{ mmscf/qtr}
 \end{aligned}$$

The quarterly fuel usage for all the NO_x process units at the facility (d_{pu}) shall be calculated according to:

$$d_{pu} = d_{fac} - (d_{large} + d_{major}) \quad (\text{Eq.26})$$

where:

d_{fac} = The quarterly fuel usage of all major and large sources and NO_x process units at the facility (mmscf/quarter or mgal/quarter).

d_{major} = The quarterly fuel usage of all major NO_x sources at the facility (mmscf/quarter or mgal/quarter).

d_{large} = The quarterly fuel usage of all large NO_x sources at the facility (mmscf/quarter or mgal/quarter).

Example Calculation:

$$\begin{aligned}
 d_{fac} &= 174 \text{ mmscf/quarter} \\
 d_{major} &= 126 \text{ mmscf/quarter} \\
 d_{large} &= 30 \text{ mmscf/quarter} \\
 d_{pu} &= d_{fac} - (d_{large} + d_{major}) \\
 d_{pu} &= 174 - (126 + 30) \\
 d_{pu} &= 18 \text{ mmscf/quarter}
 \end{aligned}$$

The quarterly heat input of all the NO_x process units at the facility (H_{pu}) shall be calculated according to:

$$H_{pu} = \sum_{i=1}^n (R_i \times T_i) \quad (\text{Eq.27})$$

where:

R_i = The maximum rated fuel capacity of a NO_x process unit (mmBtu/hr).

T_i = The quarterly accumulated operation hours for a NO_x process unit (hrs/quarter).

n = The total number of NO_x process units at the facility.

Example Calculation:

R₁ = 3.5 mmBtu/hr
 R₂ = 2.7 mmBtu/hr
 T₁ = 480 hr/quarter
 T₂ = 120 hr/quarter

$$H_{pu} = \sum_{i=1}^2 (R_i \times T_i)$$

H_{pu} = (3.5 x 480) + (2.7 x 120)
 H_{pu} = 2004 mmBtu/quarter

The maximum rated heat input capacity of all NO_x process units shall be in units of mmBtu/hr. Since internal combustion engines are usually rated in units of brake horse power, the maximum rated heat input capacity of an engine shall be computed as follows:

$$R = 0.002545 \times \text{bhp} / \text{eff} \quad (\text{Eq.28})$$

where:

R = The maximum rated heat input capacity

eff = The manufacturer's rated efficiency @LHV x (LHV/HHV)

= 0.25, if not provided by the operator

bhp = The manufacturer's rated shaft output in brake horse power

Example Calculation:

eff = 0.25
 bhp = 75 bhp
 R = 0.002545 x bhp / eff
 R = 0.002545 x 75/.25
 R = 0.7635 mmBtu/hr

If gas turbines are rated in kilowatts, the rating shall be converted to mmBtu/hr by applying the manufacturer's heat rate (in mmBtu/kw-hr). If the manufacturer's heat rate is not available, a default value of 15,000 Btu/kw-hr shall be used.

Example Calculation:

Quarterly natural gas fuel usage for an ICE with maximum rated bhp of 90 bhp, 0.25 eff and a boiler rated at 4 mmBtu/hr is being served by one fuel meter reading 10.5 mmscf. The compliance emission rate of both ICE and boiler is 0.3 lb/mmBtu.

ICE = 90 bhp Boiler = 4 mmBtu/hr
 Fuel meter reading = d_{pu} = 10.5 mmscf

I.C.E.

$R = 0.002545 \times 90 / .25 = 0.916 \text{ mmBtu/hr}$
 $t = 3 \text{ hr/day} \times 7 \text{ days/wk.} \times 4 \text{ wk./mo.} \times 3 \text{ mo/qtr} = 252 \text{ hr/qtr}$
 $H_{ice} = R \times t = 0.916 \times 252 = 230.8 \text{ mmBtu/ quarter}$

Boiler

$H_{boiler} = 4 \text{ mmBtu/hr} \times 24 \text{ hr./day} \times 7 \text{ day/wk.} \times 4 \text{ wk./mo.} \times 3 \text{ mo/qtr}$
 $H_{boiler} = 8064 \text{ mmBtu/quarter}$
 $H_{pu} = 230.8 + 8064 = 8294.8 \text{ mmBtu/qtr}$

$d_{ice} = d_{pu} \times (H_{ice}/H_{pu})$
 $= 10.5 \text{ mmscf/qtr} \times (230.8/8294.8)$
 $= .298 \text{ mmscf/qtr}$

$d_{boiler} = d_{pu} \times (H_{boiler}/H_{pu})$
 $= 10.5 \text{ mmscf/qtr} \times (8064/8294.8)$
 $= 10.2 \text{ mmscf/qtr}$

$E_{ice} = d_{ice} \times V \times ER_c$
 $= 1050 \text{ mmBtu/mmscf} \times 0.30 \text{ lb/mmBtu} \times .298 \text{ mmscf/qtr}$
 $= 93.87 \text{ lb/qtr}$

$E_{boiler} = d_{boiler} \times V \times ER_c$
 $= 10.2 \text{ mmscf/qtr} \times 1050 \text{ mmBtu/mmscf} \times 0.3 \text{ lb/mmBtu}$
 $= 3213 \text{ lb/qtr}$

$E = E_{ice} + E_{boiler} = 93.87 + 3213 \text{ lb/qtr} = 3307 \text{ lb/qtr}$

C. TOTAL QUARTERLY EMISSIONS CALCULATION FOR ALL NO_x PROCESS UNITS AT THE FACILITY

The quarterly NO_x emissions of all NO_x process units at the facility shall be estimated according to:

$$E = \sum_{i=1}^n E_i \quad (\text{Eq.29})$$

$$E_i = \sum_{j=1}^m E_j \quad (\text{Eq. 30})$$

where:

E = The total quarterly emissions for all NO_x process units

E_i = The quarterly emission of each NO_x process unit (lb/quarter)

E_j = The quarterly emission of each NO_x process unit per type of fuel (lb/quarter)

i = Each type of affected NO_x process unit

j = Each type of fuel

m = The total number of fuels consumed for each affected NO_x process unit per quarter

n = The total number of NO_x process units at the facility.

Example Calculation:

$$\begin{aligned} E_1 &= 163.8 \text{ lb/quarter} \\ E_2 &= 78 \text{ lb/quarter} \\ E_3 &= 120 \text{ lb/quarter} \\ E &= \sum_{i=1}^n E_i = 163.8 + 78 + 120 \\ E &= 361.8 \text{ lb/quarter} \end{aligned}$$

D. REPORTING PROCEDURES

1. The emissions data in any facility with an RTU shall be reported to Central Station Computer at the end of any quarter and the data shall be computed

to determine the quarterly total emissions for each source using Equations 22 through 28 as appropriate.

2. The total fuel usage data for all NO_x process units in any facility without an RTU shall be recorded in a format approved by the Executive Officer and submitted to the District as part of the Quarterly Certified Report required by Rule 2004.
3. The Facility Permit holder of NO_x process units shall maintain daily records of operation hours or quarterly usage rate for each NO_x process unit.
4. Any changes made in type of fuel used and rated capacity for each source shall be recorded by the Facility Permit holder.
5. The Facility Permit holder of any NO_x process unit that opts to monitor at the large source monitoring level shall meet the requirements set forth in "Chapter 3 Large Sources - Continuous Process Monitoring System (CPMS)".

E. FUEL METER SHARING

1. A single totalizing fuel meter shall be allowed to measure the cumulative fuel usage for more than one equipment provided that each equipment elects for the same emission rate or emission factor as specified in the Facility Permit and that any equipment in a process unit does not use the annual heat input in order to be categorized from a large source to a process unit.
2. One or more equipment in a process NO_x unit shall be allowed to share the fuel totalizing meter with the equipment in a process NO_x unit provided that each equipment elects for the same emission rate or emission factor as specified in the Facility Permit.
3. Fuel meter sharing for the interim period shall be allowed for those equipment in a process unit with the same emission rate or emission factor.

F. RULE 219 EQUIPMENT

1. Emission Determination And Reporting Requirements

- a. The Facility Permit holder shall determine the emissions for one or more equipment exempt under Rule 219 and report the emissions on a quarterly basis as part of the Quarterly Certified Emissions Report Certification of Emissions required by Rule 2004. The Facility Permit holder shall be allowed to use the existing fuel totalizer, the monthly fuel billing statement, or any other equivalent methodology to estimate their fuel usage for a quarterly period.
- b. Quarterly reporting periods shall start on January 1, 1994 for Cycle 1 Facilities and July 1, 1994 for Cycle 2 facilities.

- c. The Facility Permit holder of each equipment shall maintain the quarterly fuel usage data for all equipment exempt under Rule 219 for three years. Such data shall be made available to District staff upon request.
- d. The fuel usage for equipment exempt under Rule 219 may be used in conjunction with fuel usage for process units provided that they have the same emission factor.

B. Emission Calculations

The Facility Permit holder shall determine NO_x emissions for equipment exempt under Rule 219 as follows :

$$E_{219} = \sum_{i=1}^n EFR_i \times d_i \quad (\text{Eq.31})$$

where:

E_{219} = The total emissions for equipment exempt under Rule 219 estimated over a quarterly period (lb/ per quarter).

EFR_i = The equipment-specific or category-specific emission factor for each equipment exempt under Rule 219 equipment. The emission factor can be found in Table 3-D (lb/mmscf or lb/mgal).

d_i = The equipment-specific or category-specific fuel usage (mmscf/ per quarter or mgal/ per quarter).

n = The number of equipment exempt under Rule 219.

TABLE 4-A
MEASURED VARIABLES FOR ALL NO_x PROCESS UNITS

EQUIPMENT	MEASURED VARIABLES
All NO _x process units	<ol style="list-style-type: none">1. Fuel usage or processing/feed rate or operating time2. Production rate;

TABLE 4-B
REPORTED VARIABLES FOR ALL NO_x PROCESS UNITS

EQUIPMENT	REPORTED VARIABLES
All NO _x process units	1. Quarterly mass emissions